WVU Rockefeller Neuroscience Institute

HUMAN PERFORMANCE

TACTICAL SCIENCE DIGEST #2

December 4th, 2020

AMP²

Athletes - Military - Patients - Population

RNItacticalperformance@hsc.wvu.edu

WHAT IS THE RNI HP DIGEST?

Every other month quick summary of interesting Performance Science news and literature.

Intent to provide a digestible level of information to stir new ideas, reinforce existing ideas, and expand interest areas.

Contributions provided by RNI Performance Scientists.

DISCLAIMERS

None of the information provided should be construed as an official endorsement of any product or idea, merely to share information.

RNI scientists contributing to this newsletter declare no conflicts of interest with any products that may be mentioned.

Due to copyright restrictions, PDF articles cannot be provided, but please consult your local officials for requesting these from your library. When possible, we will aim to include Open Access articles (with links) not requiring library access.

WVU Rockefeller Neuroscience Institute

AMP²
Athletes - Military - Patients - Population

TOPICS

Each slide will cover a topic area, and will reference the icons below

Training Load

Recovery

Biomechanical Force Production

Data Science

Cognitive Function

Tactical Science

Mental Skills Training

Wellbeing

Wearables

Sleep

WVU Rockefeller Neuroscience Institute

AMP2 Athletes - Military - Patients - Population

WEARABLES: Use of commercial wearables for illness detection

BLUF: Simple metrics such as Resting Heart Rate (RHR), Activity, and Sleep may be indicators of pre-symptomatic illness

nature medicine LETTERS
https://doi.org/10.1038/s41591-020-1123-x
Check for updates

Wearable sensor data and self-reported symptoms for COVID-19 detection

Giorgio Quer[1,3], Jennifer M. Radin[1,3], Matteo Gadaleta[1,3], Katie Baca-Motes[1], Lauren Ariniello[1], Edward Ramos[1,2], Vik Kheterpal[2], Eric J. Topol[1] and Steven R. Steinhubl[1]

nature biomedical engineering ARTICLES
https://doi.org/10.1038/s41551-020-00640-6
Check for updates

Pre-symptomatic detection of COVID-19 from smartwatch data

Tejaswini Mishra[1,3], Meng Wang[1,3], Ahmed A. Metwally[1,3], Gireesh K. Bogu[1,3], Andrew W. Brooks[1,3], Amir Bahmani[1,3], Arash Alavi[1,3], Alessandra Celli[1], Emily Higgs[1], Orit Dagan-Rosenfeld[1], Bethany Fay[1], Susan Kirkpatrick[1], Ryan Kellogg[1], Michelle Gibson[1], Tao Wang[1], Erika M. Hunting[1], Petra Mamic[1], Ariel B. Ganz[1], Benjamin Rolnik[1], Xiao Li[2] and Michael P. Snyder[1]

https://www.nature.com/articles/s41591-020-1123-x
https://www.nature.com/articles/s41551-020-00640-6

Open Access – click on link for PDF

Due to the high transmissibility of COVID-19 and scarcity of accessible and reliable testing strategies, many research groups have investigated the use of commercial wearable technologies for ability to detect COVID-19 before the symptoms appear. It is now fairly standard for wearables to measure activity, sleep, and heart rate, with some also including heart rate variability and respiration rate as well.

While many groups and technologies have publicly reported varying levels of success of this application, these two publications both have large cohorts and have been published in the high tier and rigorously reviewed Nature series of journals.

Paper 1 studied 30,529 participants using personal devices including FitBit (78.4%), and any device connected via AppleHealth Kit (31.2%) and Google Fit (8.1%). 3,811 reported at least 1 symptom, 54 reported testing COVID positive, and 279 reported testing COVID negative. By looking at an individual's deviation from their own norms in RHR, Activity, and Sleep, along with subjective symptom data, models resulted in an Area Under the Curve (AUC) of 0.80 for discriminating between COVID positive and negative reports. This is compared to an AUC of 0.71 with symptoms only, showing that physiological data from wearables may increase predictability.

Paper 2 studied 5,300 participants with 32 confirmed COVID positive subjects. 3,325 wore FitBit, 984 iWatch, 428 Garmin. This group found that 63% of the COVID positive cases could have been successfully detected before symptom onset due largely from extreme elevations of RHR.

Paper 1 Reference:
Quer, G., Radin, J. M., Gadaleta, M., Baca-Motes, K., Ariniello, L., Ramos, E., ... & Steinhubl, S. R. (2020). Wearable sensor data and self-reported symptoms for COVID-19 detection. Nature Medicine, 1-5.

Paper 2 Reference:
Mishra, T., Wang, M., Metwally, A. A., Bogu, G. K., Brooks, A. W., Bahmani, A., ... & Fay, B. (2020). Pre-symptomatic detection of COVID-19 from smartwatch data. Nature Biomedical Engineering, 1-13.

TACTICAL RELEVANCE:

Physiological metrics measured via commercial wearable devices are showing promise as early warning indicators of COVID-19 positivity through deviations in simple metrics such as resting heart rate, sleep, and activity. Further studies of additional metrics (heart rate variability, respiration rate, temperature) and higher frequency data are underway and could lead toward use for illness prediction in a non-COVID world as well.

WVU Rockefeller Neuroscience Institute

AMP² Athletes - Military - Patients - Population

WELLBEING AND TACTICAL SCIENCE: Use of self-reported measures

BLUF: Subjective wellbeing measures can be a powerful and easily implemented tool in understanding an athlete's response to training loads

Review

OPEN ACCESS

Monitoring the athlete training response: subjective self-reported measures trump commonly used objective measures: a systematic review

Anna E Saw,[1] Luana C Main,[2] Paul B Gastin[1]

To learn more about this study go to:
https://bjsm.bmj.com/content/50/5/281

Open Access – click on link for PDF

Reference:

Saw, A. E., Main, L. C., & Gastin, P. B. (2016). Monitoring the athlete training response: subjective self-reported measures trump commonly used objective measures: a systematic review. British journal of sports medicine, 50(5), 281-291.

Stressors (e.g. physical, mental, environmental, social, emotional) and their impact on the (tactical) athlete should be understood to help augment training and recovery recommendations. Many different quantifiable measures can be applied, such as performance, physiological, biochemical, and subjective, to understand the acute and chronic impacts of these stressors. While a holistic approach including all of these measures would be ideal, logistics – notably time and cost – will always be a factor. Of all of these measures, subjective wellbeing (i.e. wellness questionnaires) are the least expensive most flexible, and easiest to implement.

This meta-analysis review paper down-selected 56 original research studies to analyze the link between subjective and objective measures in response to changes in acute and chronic training loads. The most common subjective measures used were the POMS, RESTQ-S, and DALDA.

Subjective measures consistently responded to acute increases in training load (decrease in wellbeing scores) as well as acute decreases in training load (improved wellbeing scores). Additionally, they were responsive to changes in chronic training load as well. Both of these findings agree with other narrative reviews of using subjective measures as overtraining markers.

Associations between subjective measures with physiological, biochemical, and performance markers were sporadic.

This meta-analysis shows the utility of subjective measures for understanding response to changes in acute and chronic training loads, and a lack of strong association between other objective markers shows that a combination of both subjective and objective measures is needed for monitoring of the athlete response to stressors.

TACTICAL RELEVANCE:

Subjective wellbeing measures are responsive to changes in acute and chronic training loads and can be implemented with very low invasiveness and for minimal cost. Combining this with other objective measures can provide a more robust picture of an athlete's response to stress.

WVU Rockefeller Neuroscience Institute

TRAINING LOAD: Optimizing Warfighter Training Adaptations and Performance

AMP² Athletes - Military - Patients - Population

BLUF: The enhancement of muscular strength and endurance capacities should be one of the primary outcomes of military training for increased confidence in mission preparedness

Journal of Science and Medicine in Sport 21 (2018) 1131–1138

Contents lists available at ScienceDirect

Journal of Science and Medicine in Sport

journal homepage: www.elsevier.com/locate/jsams

Review

Optimising training adaptations and performance in military environment

Heikki Kyröläinen[a,b,*], Kai Pihlainen[c], Jani P. Vaara[b], Tommi Ojanen[d], Matti Santtila[b]

[a] Faculty of Sport and Health Sciences, Biology of Physical Activity, University of Jyväskylä, Finland
[b] Department of Leadership and Military Pedagogy, National Defence University, Finland
[c] Training Division, Defence Command, Finland
[d] Human Performance Division, Finnish Defence Research Agency, Finland

To learn more about this study go to:
https://www.sciencedirect.com/science/article/pii/S1440244017318650

Open Access – click on link for PDF

Reference:

Kyröläinen, H., Pihlainen, K., Vaara, J. P., Ojanen, T., & Santtila, M. (2018). Optimising training adaptations and performance in military environment. Journal of Science and Medicine in Sport, 21(11), 1131-1138. doi:10.1016/j.jsams.2017.11.019

To improve the physical preparedness of warfighters ***throughout*** the entire span of their career, one must garner a continual and complete understanding of how military training influences physical performance. More specifically, high capacities for muscular strength and endurance are favorable for effectively executing (and maintaining) common military tasks such as traversing rugged terrain, jumping over barriers, and marksmanship during fatiguing states.

Warfighters that possess higher levels of physical fitness (i.e., stronger) are also at a much lesser likelihood of sustaining a musculoskeletal injury (MSKI). This is a problem that must be addressed immediately as the typical fitness capacities (and body comp) of entry-level warfighters are on a steady decline over the last several years.

A Scientific Review of Existing Publications on Military Training Styles and Outcomes

The review by Kyröläinen et al. acknowledges the notion that MSKI's are a growing concern in military environments that must be counteracted with improved training strategies. Ideally, military training should not elicit nonfunctional overreaching (or burnout), a common contributor to MSKIs, but should elicit enhancements of strength and endurance.

After reviewing 60 published research articles on different types of military training and their effects on physical performance, Kyröläinen et al. determined that there is too much monotony in training by way of low-intensity endurance training (especially during first stages of entering into the military) performed in high-volumes (i.e., multiple iterations of long, slow ruck marches within a given day and/or week). This type of training - voluminous, low intensity endurance exercise - increases likelihood of MSKIs, especially in those warfighters that have low fitness levels and are overweight. The increased likelihood of MSKIs is also due to the hinderances of improving muscular strength during training periods that involve high volume, low intensity endurance exercise.

The Take-Home Message

To remedy the monotony of low intensity endurance exercise, some strategies for updating training regimens might include: ***1)*** *individualized training for each warfighter based on physical adaptations* ***2)*** *lessening the repetitions of low intensity endurance exercise within a given week* ***3)*** *implementing a progressive overloading technique for each warfighter* ***4)*** *greater prioritization for maximal strength capacities and* ***5)*** *block periodization of strength and endurance training.*

TACTICAL RELEVANCE

High capacities of muscular strength and endurance are necessary for a warfighter to effectively perform common movements observed during missions that comprise high physical workloads. For the enhancement of mission preparedness and, ultimately, mission success, the physical training of warfighters must focus on progressive improvements in both maximal strength and endurance.

WVU Rockefeller Neuroscience Institute

AMP² Athletes - Military - Patients - Population

RECOVERY: Use of Heart Rate Variability

BLUF: HRV is an effective health and performance tool in the tactical environment.

frontiers in Public Health

SYSTEMATIC REVIEW
published: 09 November 2020
doi: 10.3389/fpubh.2020.583336

Check for updates

Relationships Between Heart Rate Variability, Occupational Performance, and Fitness for Tactical Personnel: A Systematic Review

Colin Tomes[1,2], Ben Schram[2†] and Robin Orr[2]*

[1] Faculty of Health Science and Medicine, Bond University, Robina, QLD, Australia, [2] Tactical Research Unit, Bond University, Robina, QLD, Australia

To learn more about this study go to:
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7680786/

Open Access – click on link for PDF

Heart rate variability's (HRV) use is becoming more popular in the fitness community and is still gaining in popularity in the tactical community (military, police, and firefighters). Though HRV has been validated in the clinical settings, its use in the tactical setting is somewhat controversial regarding its applicability in the field.

A systematic review of the scientific literature was undertaken by Tomes and colleagues (2020) examining the usefulness of HRV in the tactical setting. The review included HRV parameters used in the tactical setting from a performance perspective. After an exhaustive search of 233 studies from the literature, only 20 high quality studies included tactical performance in the field.

The results of this review determined that HRV is an effective tool for assessing psychophysiological responses of tactical personnel during occupational relevant activities as well as recovery from those activities. However, the researchers cautioned that measuring methods used to obtain HRV be carefully selected and applied. Furthermore, best practices should be consistent, and the application should be specific to the tactical population being assessed.

Reference:
Tomes, C., Schram, B., & Orr, R. (2020). Relationships between Heart Rate Variability, Occupational Performance, and Fitness for Tactical Personnel: A Systematic Review. Frontiers in Public Health, 8.

TACTICAL RELEVANCE:
The use of HRV as a tool to assess the Autonomic Nervous System in tactical personnel provides the practitioner and warfighter actionable information to modulate training and recovery for sustained operational performance.

WVU Rockefeller Neuroscience Institute

BIOMECHANICAL FORCE PRODUCTION: Using Loaded Jumps to Assess Relative Strength Capacity

AMP² Athletes - Military - Patients - Population

BLUF: Loaded jump testing serves as a worthy alternative (under time constraints) or complement (ideally) to one-repetition maximum and/or isometric mid-thigh pull testing

International Journal of Sports Physiology and Performance, 2009, 4, 461-473

Relationship Between Strength Characteristics and Unweighted and Weighted Vertical Jump Height

Jenna M. Kraska, Michael W. Ramsey, G. Gregory Haff, Nate Fethke, William A. Sands, Margaret E. Stone, and Michael H. Stone

To learn more about this study go to:
https://journals.humankinetics.com/view/journals/ijspp/4/4/article-p461.xml

The common warfighter spends a considerable amount of time performing physical tasks under external loads that originate from their gear and equipment. In order for a warfighter to perform their occupational duties effectively, they must be able to generate enough forces to overcome the external forces that act against their moving body. In other words, mission success, especially in missions that involve high physical workload demands, is positively impacted by maximal and relative strength capacities (along with other physical and psychological factors).

Strategies to objectively monitor strength typically involve one-repetition maximum (1RM) or isometric mid-thigh pull (IMTP) testing. However, 1RM testing is often disruptive to training cycles as it is inherently fatiguing and not ideal for many scenarios in the military, whereas IMTPs involve specialized equipment (e.g., completely immobilized testing rack) that is not always paired with force plates. For these reasons, **loaded jump testing** presents as an intriguing option for:

1) Coupling with IMTP testing when/where possible

And

2) Serving as a reliable, quick, non-fatiguing assessment tool for strength capacity

In the study by Kraska et al., they were interested in relationships between maximal strength assessed via IMTP and the jump performances (i.e., jump height) during unloaded and loaded (20 kg) squat jumps (SJ) and countermovement jumps (CMJ). Indeed, isometric peak force (i.e., maximal strength from IMTP) was sensitive to changes in jump performance during loaded conditions such that **stronger athletes expressed significantly lesser decrements to power output** (i.e., jump height) compared to weaker athletes when both were **placed under 20 kg of external load**.

References:
Kraska, J. M., Ramsey, M. W., Haff, G. G., Fethke, N., Sands, W. A., Stone, M. E., & Stone, M. H. (2009). Relationship Between Strength Characteristics and Unweighted and Weighted Vertical Jump Height. International Journal of Sports Physiology and Performance, 4(4), 461-473. doi:10.1123/ijspp.4.4.461

TACTICAL RELEVANCE:
For those with the capability of executing IMTP testing, the inclusion of loaded jump testing provides additional insights into a warfighter's power output and relative strength capacity when they are under external load, as is the case in many tactical environments. For those that do not have IMTP testing equipment, loaded jumps serve as a worthy alternative for assessing relative strength capacities on an individualized-basis.

WVU Rockefeller Neuroscience Institute

BIOMECHANICAL FORCE PRODUCTION: Countermovement Jumps with External Loads

AMP² Athletes - Military - Patients - Population

BLUF: Countermovement jump performances with combat uniform and gear may be more related with military simulated tasks than jumps without.

ORIGINAL RESEARCH

Associations of Physical Fitness and Body Composition Characteristics With Simulated Military Task Performance

Pihlainen, Kai[1]; Santtila, Matti[2]; Häkkinen, Keijo[3]; Kyröläinen, Heikki[2,3] Author Information

Journal of Strength and Conditioning Research: April 2018 - Volume 32 - Issue 4 - p 1089-1098
doi: 10.1519/JSC.0000000000001921

To learn more about this study go to:
https://journals.lww.com/nsca-jscr/Abstract/2018/04000/Associations_of_Physical_Fitness_and_Body.25.aspx

Measures of lower body power (i.e. the countermovement jump, CMJ), are related with relevant occupational testing batteries in tactical settings. However, being equipped with external loads impairs jump performances, as well as high-intensity military related tasks. Therefore, unlike a majority of sports, testing unloaded CMJs may not be as related to occupational performances. Considering the requirement of tactical populations to carry combat gear, protective equipment, or some combination of the two, the evaluation of biomechanical movement consequences is necessary.

Pihlainen et al. assessed 81 soldiers while on deployment. The soldiers completed a military simulated task that included, sprinting, crawling, jumping over obstacles in combat dress uniform and gear, including body armor, helmet, and an assault rifle replica. Soldiers also completed a battery of physical fitness testing, including lower body power (standing long jump, countermovement jump (unloaded and loaded with combat gear)), as well as traditional endurance and isometric strength testing.

The military simulated task was related with a variety of physical traits including lower body power, upper and lower body strength, muscle endurance, and anaerobic capacity; thus, it was considered a valid military specific assessment of anaerobic combat scenarios. The findings also suggested that the mass of the combat load (19.5 ± 1.0 kg) reduced CMJ height by 25 ± 5%. Additionally, although all lower body power assessments were strongly related with the military simulated task, the loaded CMJ showed the strongest relationship. Furthermore, the loaded CMJ explained the most variance in the military simulated task performances out of all assessments.

References:

Pihlainen, K., Santtila, M., Häkkinen, K., & Kyröläinen, H. (2018). Associations of physical fitness and body composition characteristics with simulated military task performance. The Journal of Strength & Conditioning Research, 32(4), 1089-1098.

TACTICAL RELEVANCE:

Unloaded countermovement and standing long jump assessments are useful for monitoring 1) neuromuscular fatigue from high intensity training and 2) the ability to perform military simulated tasks. However, performing the countermovement jump with the combat uniform and gear may be most related to occupational tasks where the same equipment is to be worn.

WVU Rockefeller Neuroscience Institute

AMP2 Athletes - Military - Patients - Population

BIOMECHANICAL MONITORING:
Balance Control after Traumatic Brain Injury

BLUF: Postural sway and balance control asymmetries may be used to monitor alterations in balance control following traumatic brain injuries.

Characterization of Balance Control After Moderate to Severe Traumatic Brain Injury: A Longitudinal Recovery Study FREE

Olinda Habib Perez, Robin E Green, George Mochizuki

Physical Therapy, Volume 98, Issue 9, September 2018, Pages 786–795,
https://doi.org/10.1093/ptj/pzy065
Published: 06 June 2018 **Article history** ▾

To learn more about this study go to:
https://academic.oup.com/ptj/article/98/9/786/5033699
Open Access – click on link for PDF

Forty-five participants who have suffered a traumatic brain injury (TBI) and twenty-two participants who were considered healthy completed balance testing on single or dual force plates. The unipedal and bipedal (eyes open and eyes closed) balance testing were conducted at 2-, 5-, and 12-months post-injury. The root mean square of the net center of pressure forces from both feet were assessed in the medial-lateral (side to side) and anterior-posterior (front to back) directions. Additionally, the Community Balance and Mobility (CB&M) Scale was used as a clinical measure.

Those who suffered a TBI fell below balance control of healthy participants during bipedal eyes open and eyes closed conditions. Further, postural inter-limb asymmetries were noted in those with moderate to severe TBI, such as medial- lateral interlimb synchrony. When examining asymmetries of unipedal balance abilities between limbs, the duration of unipedal stance may be a useful tool for assessing balance during recovery from TBI and provides an assessment option for when force plates are unavailable. The CB&M scale was improved from month 2 to month 5 and 12, but no difference was noted between from month 5 to 12. Force plate balance control showed improvements in medial-lateral parameters up to 5 months, but net balance within the anterior-posterior direction was not improved.

Thus, for those who suffered a TBI, balance may improve over time, but most improvements may occur early (within 5 months after injury). Further, balance control may be most impaired by center of pressure sway in the medial-lateral direction. Although more research is needed, this study has highlighted the potential use of balance assessments for monitoring the recovery of patients who suffer a TBI.

References:

Perez, O. H., Green, R. E., & Mochizuki, G. (2018). Characterization of balance control after moderate to severe traumatic brain injury: A longitudinal recovery study. Physical therapy, 98(9), 786-795.

TACTICAL RELEVANCE:

Postural sway, as indicated via medial-lateral center of pressure deviations, may be used to monitor alterations and progress in balance control following traumatic brain injuries. Further, asymmetries may be assessed via unipedal stance duration differences between limbs, which is impaired and shows uncertain progress in individuals who suffered a TBI.

WVU Rockefeller Neuroscience Institute

DATA SCIENCE: Implications of Artificial Intelligence on Human Performance

AMP² Athletes - Military - Patients - Population

BLUF: Optimizing warfighters at the strategic, operational and tactical level using AI technology.

Original research

The implications of emerging technology on military human performance research priorities

Daniel C. Billing [a, e], Graham R. Fordy [b], Karl E. Friedl [c], Henriette Hasselstrøm [d]

Show more

Share Cite

https://doi.org/10.1016/j.jsams.2020.10.007

Get rights and content

To learn more about this study go to:
https://www.jsams.org/article/S1440-2440(20)30786-6/fulltext

Emerging technological solutions provide the capability to enhance operational readiness and performance. The premise of artificial intelligence (AI) systems or future generation computing capabilities is to mimic the functions of the human brain and aid in decision making tasks. Human-machine teams may result in faster execution of objectives, decreased cognitive workload, and unbiased resolutions.

Strategic: Humans can make and act on recommendations from cloud based robotic systems that continuously stream data in real time; however, there are undoubtedly ethical, moral, and legal challenges associated with "allowing" machines to make decisions.

Operational: AI assisted analysis, allows for the detection of patterns unbeknownst to the human eye. For instance, imagery captured remotely by unmanned airborne systems can undergo automated feature extraction and classification through machine or deep learning algorithms. Thus, these systems can optimize current surveillance and reconnaissance methodologies.

Tactical: Using AI models, a warfighter's physical and cognitive workloads can be monitored and forecasted to achieve optimal operational readiness. Based on physiological and cognitive data from an individual's previous training loads, their performance in future instances can be predicted.

While this brief summary of the article focused on data science and AI, many other very intriguing topics were discussed in the full article.

Reference:

Billing, D. C., Fordy, G. R., Friedl, K. E., & Hasselstrøm, H. (2020). The implications of emerging technology on military human performance research priorities. *Journal of Science and Medicine in Sport*.

TACTICAL RELEVANCE:

The incorporation of AI based solutions in tactical settings increases the performance capabilities of the warfighter and other operational personnel, by decreasing cognitive workload and providing informed solutions through data.

DATA SCIENCE: Building Tools to help Guide Analysis and Understanding

BLUF: A method to help reduce the vast size of large data sets into meaningful outcomes.


iJET International Journal of Emerging Technologies in Learning

HOME ABOUT LOGIN REGISTER SEARCH CURRENT ARCHIVES ANNOUNCEMENTS

Home > Vol 14, No 22 (2019) > Pan

Download this PDF file

A Big Data-Based Data Mining Tool for Physical Education and Technical and Tactical Analysis

https://doi.org/10.3991/ijet.v14i22.11345

Lili Pan
Baoji University of Arts and Sciences, Baoji, China
47587495@qq.com

Large datasets, more formally known as Big Data, are becoming increasingly more prevalent as abundances of data are made available through advances in technologies. The current challenge with Big Data is deciphering any inherent noise in the data and delivering an informative analysis. Data mining is the technique of reducing the vast amount of data to more easily interpretable and reliable information. There are a wide variety of technologies, theories and methods to conduct data mining, with a combination of several techniques typically providing the best results.

This paper describes an example of a tool built to filter the data down to useful information that a badminton coach could use in a variety of ways. Those ways include player improvement, opponent scouting, and gain competitive advantages.

To learn more about this study go to:
https://onlinejour.journals.publicknowledgeproject.org/index.php/i-jet/article/view/11345/6155

Open Access – click on link for PDF

Reference:

Pan, L. (2019). A Big Data-Based Data Mining Tool for Physical Education and Technical and Tactical Analysis. International Journal Of Emerging Technologies In Learning (Ijet), 14(22), 220-231.

TACTICAL RELEVANCE:

Collecting data helps lead to acquiring information and turning that into knowledge. Once we cross our threshold of the amount of data we can digest without assistance, the extraction of knowledge becomes more challenging. Building tools to assist us with this process will help eliminate noise, work more efficiently, and act quicker on decisions.

DATA SCIENCE: How Excel Can Be Used For S&C

ARTICLE

Data Analysis for Strength and Conditioning Coaches

Using Excel to Analyze Reliability, Differences, and Relationships

Turner, Anthony MSc, CSCS*D[1]; Brazier, Jon MSc, CSCS[2]; Bishop, Chris MSc[1]; Chavda, Shyam MSc, CSCS[1]; Cree, Jon MSc[1]; Read, Paul MSc, CSCS[3] Author Information

Strength & Conditioning Journal: February 2015 - Volume 37 - Issue 1 - p 76-83
doi: 10.1519/SSC.0000000000000113

To learn more about this study go to:
https://www.researchgate.net/publication/272507171_Data_Analysis_for_Strength_and_Conditioning_Coaches_Using_Excel_to_Analyze_Reliability_Differences_and_Relationships

Microsoft Excel is used daily, in a multitude of ways, by many individuals. The vastness of its application differs greatly amongst its users, but the general familiarity of Excel makes it a powerful tool for basic data analysis. The strength & conditioning coaches in this article describe, in detail, the application of several techniques to a dataset and the resultant findings. The formulas used in Excel to conduct each test are included, as well as a description of the calculations, the underlying purpose, and good rules of thumb for desired values. They discuss four main topics which are: Data Accuracy, Goal Setting, Changes in Data, and Relationships. These four areas cover the following calculations and analyses that can be performed easily in Excel. Data Accuracy may be considered as the reliability of metrics between trials of testing and is often calculated via the Coefficient of Variation. Goal setting can be obtained by calculating Smallest Worthwhile Change to show true improvements or declines in performance beyond standard noise in the data. Changes in Data can best be quantified in magnitude by calculating Effect Sizes, such as *Cohen's d*. Relationships between metrics or tests can be visually displayed in a graph and the strength of the relationship may be defined using a correlation coefficient, such as *Pearson's r*.

Many practitioners have an adequate level of familiarity with Microsoft Excel and may have datasets already stored within this software. This article is a useful source for those interested in conducting their own analysis and investigation on their data, as it explains the purpose of each analysis and provides a guide for conducting each analysis. A basic understanding of any dataset helps create buy-in when looking to present a coach with findings supported by data and can be translated to a variety of other fields.

Reference:

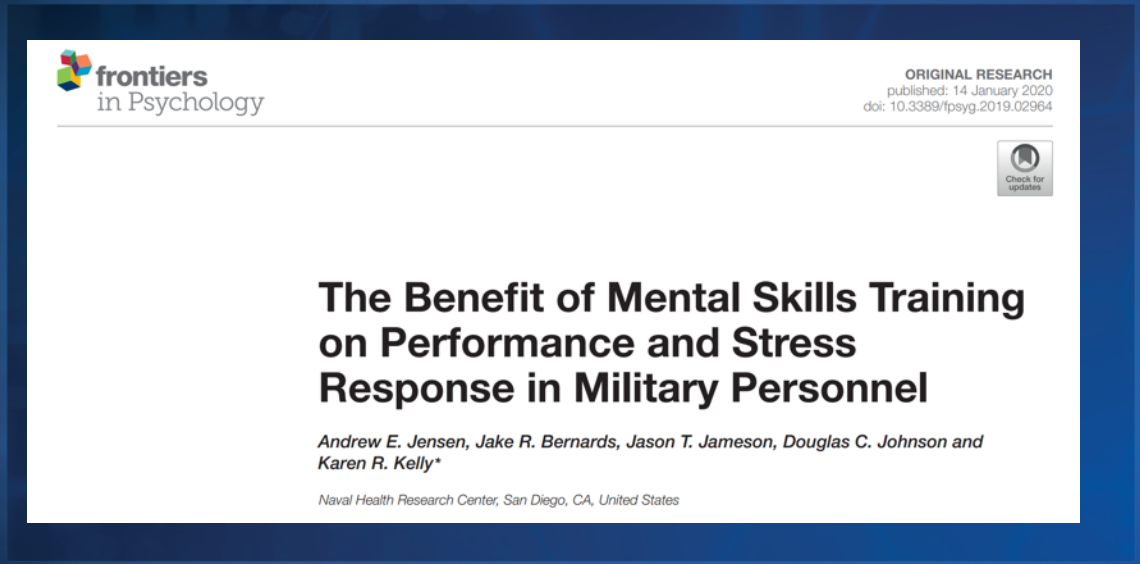
Turner, A., Brazier, J., Bishop, C., Chavda, S., Cree, J., & Read, P. (2015). Data analysis for strength and conditioning coaches: Using excel to analyze reliability, differences, and relationships. Strength & Conditioning Journal, 37(1), 76-83.

TACTICAL RELEVANCE:

The use of Microsoft Excel can provide the practitioner access to quick data analysis that can be made actionable for the warfighter. A basic understanding of your dataset can help create buy-in when looking to present the warfighter with findings within the data and can be translated to a variety of other fields.

COGNITIVE FUNCTION: Mental Skills Training

BLUF: Mental Skills Training increases cognitive performance in stressful conditions.



frontiers in Psychology

ORIGINAL RESEARCH
published: 14 January 2020
doi: 10.3389/fpsyg.2019.02964

The Benefit of Mental Skills Training on Performance and Stress Response in Military Personnel

*Andrew E. Jensen, Jake R. Bernards, Jason T. Jameson, Douglas C. Johnson and Karen R. Kelly**

Naval Health Research Center, San Diego, CA, United States

To learn more about this study go to:
https://www.frontiersin.org/articles/10.3389/fpsyg.2019.02964/full

Open Access – click on link for PDF

Reference:

Jensen, A. E., Bernards, J. R., Jameson, J. T., Johnson, D. C., & Kelly, K. R. (2020). The Benefit of Mental Skills Training on Performance and Stress Response in Military Personnel. Frontiers in Psychology, 10, 2964.

Mental Skills Training has been accepted and used successfully in sports for increasing cognitive performance. Mental Skills Training (MST) in the military setting has not seen wide-spread use within traditional training programs. Jensen et al. (2020) reported that combat stress has been associated with decrease in reaction times, sustained attention, and impulse control, all which are vital to operational success. In addition, the inability to adapt to combat stress leads to impaired cognitive function, subtle neurologic compromise, neuroendocrine dysregulation, low levels of unit cohesion, and decrease levels of psychosocial support.

Researchers studied 203 Marines attending a Basic Reconnaissance Course in which they were divided into 3 groups consisting of Mindfulness-Based Mind Fitness Training (MMFT), General Mental Skills Training (GMST), or Training-As-Usual (TAU). Marines that received either MMFT or GMST performed better than those in the TAU group. In addition, recall, plot accuracy and plot time estimation were significantly better ($p < 0.001$) in both MST groups than that of the TAU group. However there were no differences between MMFT and GMST groups.

Based on these observations, researchers concluded that a Mental Skills Training program, independent of the specific type used, has fundamental characteristics of stress regulation embedded within each Mental Skills Training program may enhance performance and cognitive function during time of heightened stress.

TACTICAL RELEVANCE:

Cognitive performance is critical to operational success. Mental Skills Training provides foundational skills to enhancing cognitive performance during times of heighten stress.